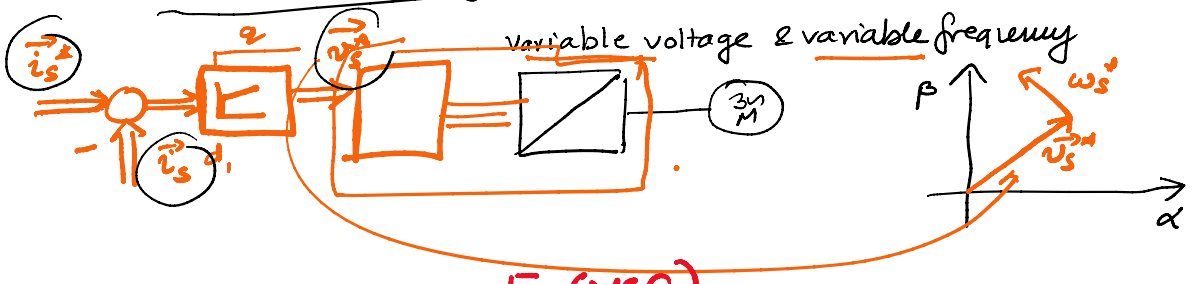
2Nov23

Thursday, November 2, 2023 6:00 PM

Today's class

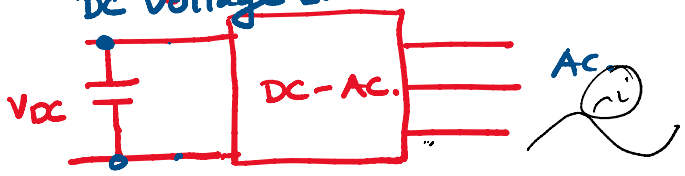
1. How to get variable voltage variable frequency
2. Inverters, DC2Ac converter
3. PWM principle.
4. Sinewave PWM
5. Spacevector Modulation - principle.
6. Devices used in voltage source converters

Problem solving & How to study for EE3503



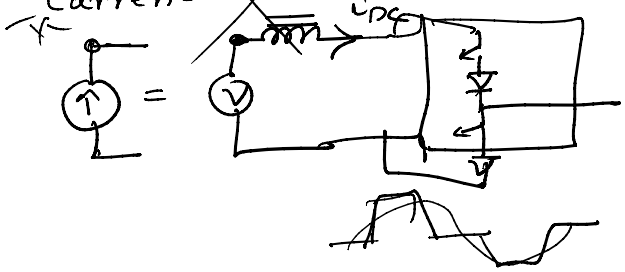
Voltage Source Converter (VSC)

DC Voltage Link converter



Names used in industry: Inverter, VSC, DC to Ac.

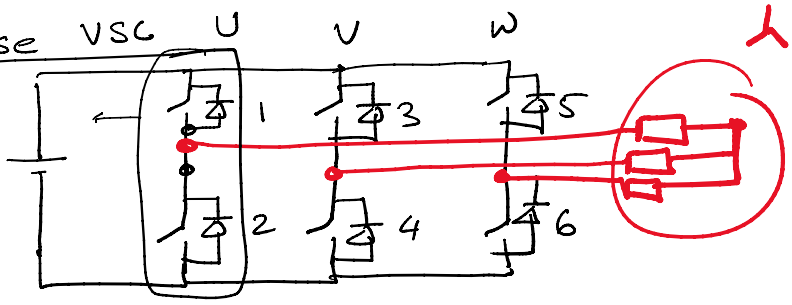
History - 1970s - Current Source Inverter CSI



Requirement

ϕ const. $\quad \frac{|V_s|}{|\omega_s|} = \text{const.}$

3-phase VSC



↓ .. connected load.

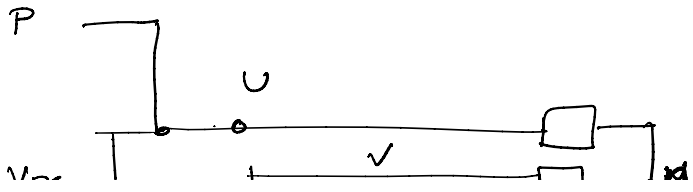
phaseleg U has 2 state

SU=1 G1=1, G2=0, SU=0, G1=0, G2=1

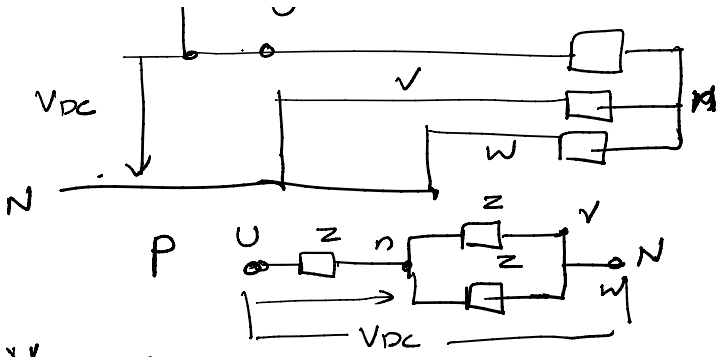
Total number of states

$$(\text{State})^{\text{phase}} = 2^3 = 8$$

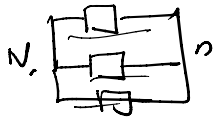
	SU	SV	SW
1	1	0	0
2	1	1	0



2	1	1	0
3	0	1	0
4	0	1	1
5	0	0	1
6	1	0	1
7	0	0	0
8	1	1	1



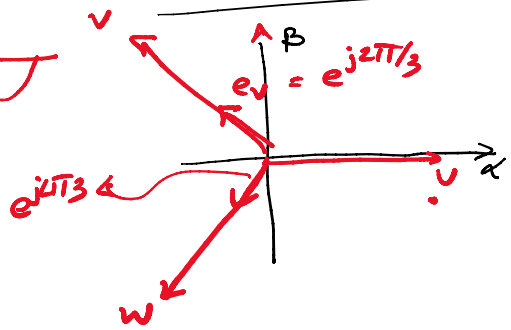
$V_{UN} = \frac{2}{3} V_{DC}$ $\quad V_{VN} = -\frac{1}{3} V_{DC} = V_{WN}$.



000 $\quad V_{UN} = V_{VN} = V_{WN} = 0$

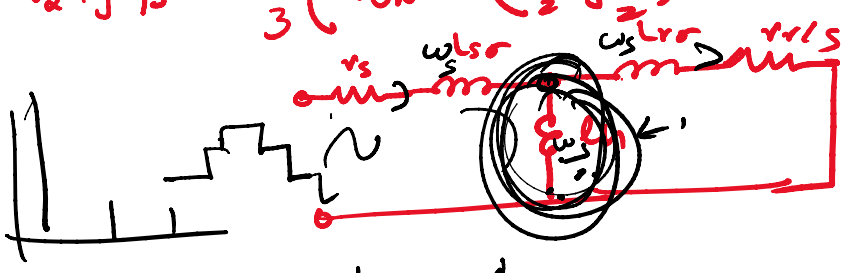
$V_\alpha = V_{UN}$ / phase voltage?

$V_{VN} =$



$V_{\alpha\text{-}\beta} = T \cdot \begin{bmatrix} V_{UN} \\ V_{VN} \\ V_{WN} \end{bmatrix}$

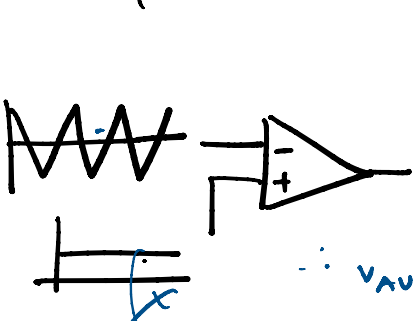
$V_\alpha + jV_\beta = \frac{2}{3}\left(V_{UN} + \left(-\frac{1}{2} + j\frac{\sqrt{3}}{2}\right)V_{VN} + \left(-\frac{1}{2} - j\frac{\sqrt{3}}{2}\right)V_{WN}\right)$

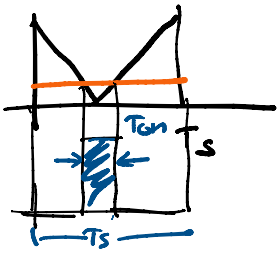


$l_s = l_h + l_{s\sigma}$ leakage

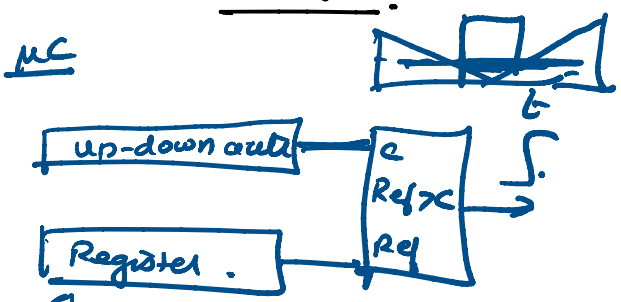
$l_r = l_h + l_{r\sigma}$

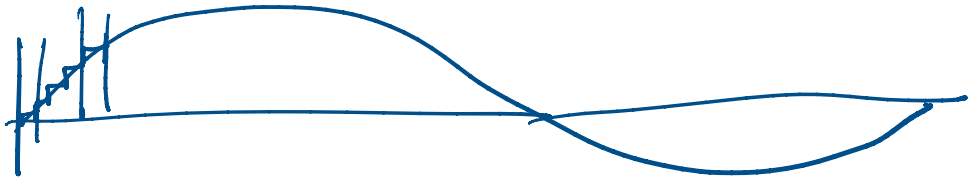
mutul flux.



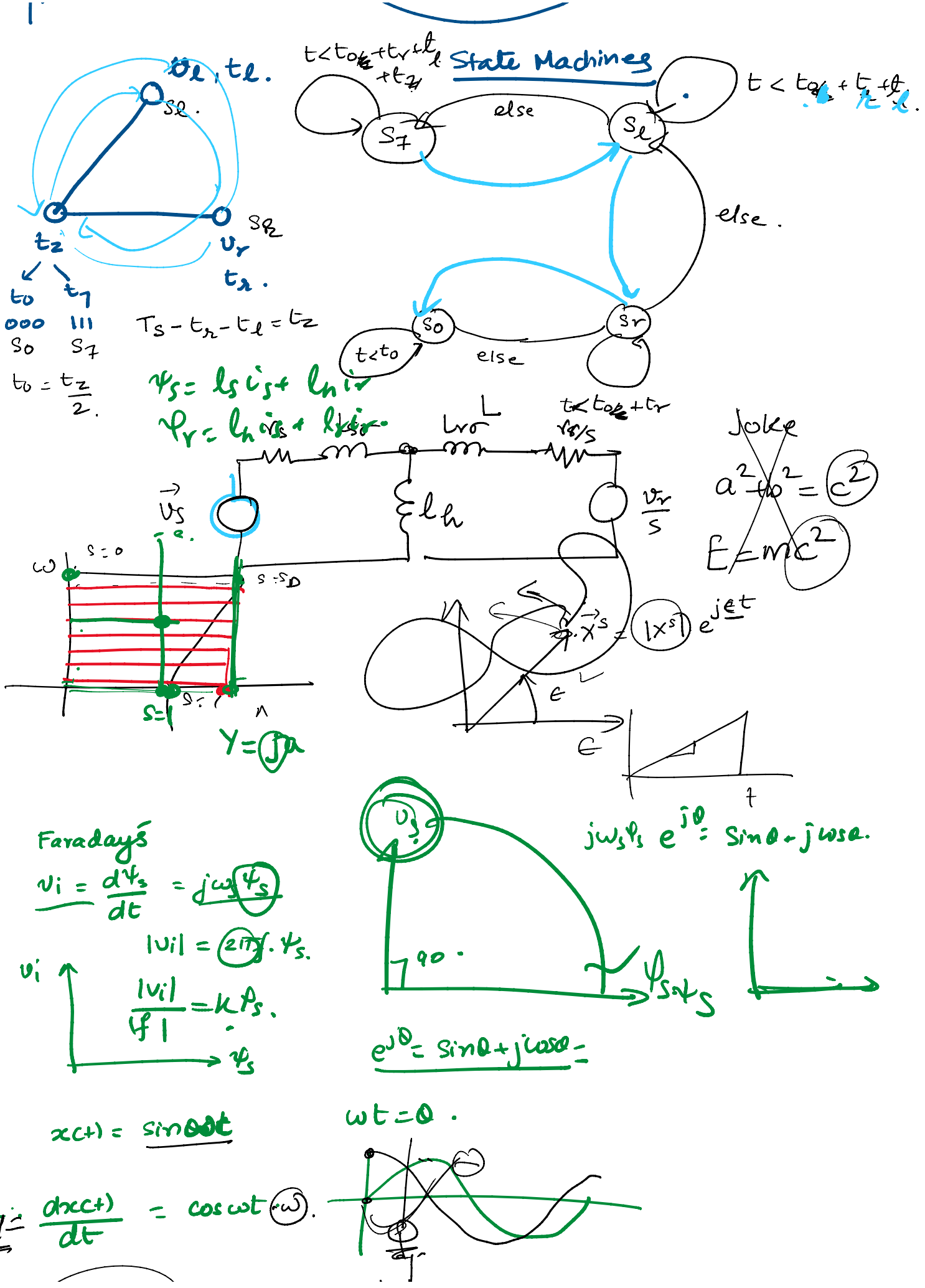


$\therefore V_{AV} = V_{DC} \cdot \frac{T_{on}}{T_s}$.



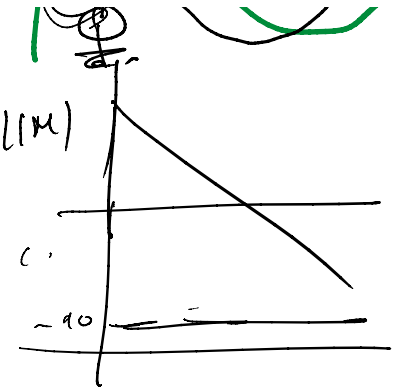


$t < t_{on} + t_r + t_f$ State Machines


State Machines
else
else.
else
$T_s - t_r - t_l = t_2$
$\psi_s = l_s i_s + l_h i_r$
$\psi_r = l_h i_s + l_r i_r$
Joke
$a^2 + b^2 = c^2$
$E = mc^2$
$Y = j\omega$
Faradays
$v_i = \frac{d\psi_s}{dt} = j\omega\psi_s$
$|v_i| = \omega \cdot \psi_s$
$\frac{|v_i|}{|\psi|} = k\psi_s$
$e^{j\theta} = \sin\theta + j\cos\theta$
$x(t) = \sin\omega t$
$y = \frac{dx(t)}{dt} = \cos\omega t \cdot \omega$
$\omega t = 0$
90°

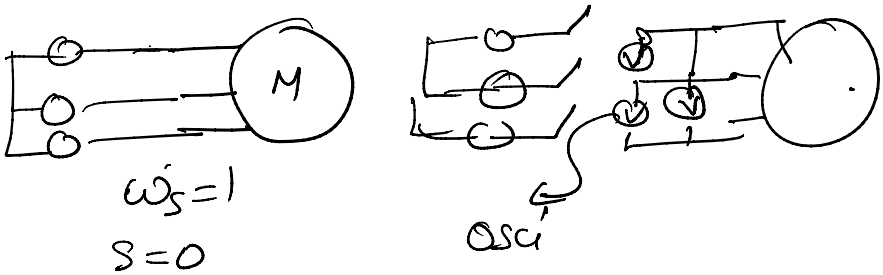
Y- dt

$\int x(t)\,dt = -\frac{\cos \omega t}{\omega}$



(1) An IM ... is running steady stati -- no-load ---

I disconnect the stator from supply



$\omega_s = 1$

$S = 0$